

NEW COMBINATIONS IN *FESTUCA CALIFORNICA* (POACEAE)

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ABSTRACT

The *Festuca californica* Vasey complex is examined. Considerable morphological variation exists within and between populations which range from western Oregon to southern California. The characters of sheath pubescence, sclerenchyma distribution in the blades of vegetative shoots and ligule length are of use in distinguishing three taxa in the complex. Analysis of character variation and geographic distribution suggests that these taxa are best treated at the rank of subspecies; the new combinations *Festuca californica* subsp. *hitchcockiana* and *F. californica* subsp. *parishii* are provided.

RESUMEN

Se examina el complejo *Festuca californica* Vasey. Existe una variación morfológica considerable en y entre poblaciones que van desde el Oeste de Oregon hasta el Sur de California. Los caracteres pubescencia de la vaina, distribución de esclerenquima en las láminas de los tallos vegetativos y longitud de la ligula se usan para diferenciar los tres taxa del complejo. El análisis de la variación del carácter y distribución geográfica sugieren que estos taxa deben tratarse en el rango de subspecies; Se hacen las nuevas combinaciones *Festuca californica* subsp. *hitchcockiana* y *F. californica* subsp. *parishii*.

California fescue, *Festuca californica* Vasey, is the largest North American species of the genus and shows considerable variation in many morphological characters. It is usually readily distinguished from other North American species of *Festuca* by its large size and the presence of stiff hairs on the leaf collar region. These hairs may be absent over the back of the sheath apex and restricted to the margins (auricular region). Occasionally collar hairs are absent altogether on some sheaths, but examination of a number of leaves on the same plant will usually reveal hairs on the collar margins of at least some leaves.

Morphological variation was examined on 113 specimens of *Festuca californica* sensu lato, including three taxa that are sometimes recognized as separate species (e.g., Alexeev 1982; Aiken et al. 1997). Variation in characters used to distinguish taxa did not consistently correlate to allow the unambiguous recognition of separate species, although three infraspecific taxa may be recognized with some confidence. In addition to their morphological differences, they have largely separate distributions, hence are best treated as subspecies.

Unless otherwise stated, the descriptions of leaves refer to those of the sterile vegetative shoots or innovations which form a large proportion of the densely caespitose clumps of these bunch-grasses. The width of convolute, involute or conduplicate leaf blades is given as the widest diameter.

Festuca californica Vasey, Contr. U.S. Natl. Herb. 1(8):277. 1893. TYPE: U.S.A. CALIFORNIA. Oakland hills, 1862, H.N. Bolander 1505 (HOLOTYPE: US-556212).

Bromus kalmii var. *aristulatus* Torr., Pacific Railr. Rep. 4(5):157. 1857. *Festuca aristulata* (Torr.) Shear ex Piper, Contr. U.S. Natl. Herb. 10(1):32. 1906. *Festuca altaica* subsp. *eualtaica* var. *aristulata* (Torr.) St.-Yves, Candollea 2:273. 1925. TYPE: U.S.A. CALIFORNIA. Mark West's Creek, 30 Apr 1854, J.M. Bigelows.n. (LECTOTYPE, designated by Piper 1906: 33; US-556211); ISOLECTOTYPE: GH).

Plants densely caespitose, without rhizomes. **Culms** (30-)60-150(-275) cm tall; internodes glabrous to pubescent (often pubescent for up to 20 mm below the nodes). **Prophylls** 2-9 cm long, scabrous to pubescent (at least apically) and usually scabrous or ciliate on the veins. **Sheaths** open to the base, margins overlapping, glabrous or scabrous to pilose (sometimes only at the apex or on upper margins), persistent; **collars** usually densely pubescent, sometimes inconspicuously pubescent, with a few hairs at the margins, or glabrous; **ligules** (0.2-)0.8-1.5(-6) mm (ligules of the cauline leaves tend to be somewhat longer than those of the vegetative shoots), usually ciliate at apex, abaxial surface glabrous to pubescent; **blades** (0.5-)0.8-2(-2.5) mm wide (3-6.5 mm wide when flat), convolute, involute, conduplicate or flat, abaxial surface glabrous, scabrous or basally pubescent or pilose, adaxial surface puberulent to densely pubescent-pilose or more or less tomentose, 9-17(-19) veins, (3-)5-17(-19) adaxial ribs; **sclerenchyma** in a more or less continuous abaxial band or ring, usually with pillars or girders present at most veins, sometimes reduced to small strands at abaxial and adaxial surfaces (Fig. 1). **Inflorescences** (10-)15-25(-30) cm long, open; **branches** terete or angular, glabrous to scabrous-pubescent (especially on angles) and sometimes pubescent at the base in the axils of lower branches, spreading and lax, (1-)2(-3) per node, lower branches with a distinct pulvinus. **Spikelets** (8-)10-18(-20) mm long, borne toward the ends of the branches, usually green or sometimes reddish-purple, with (3-)4-6(-8) florets. **Glumes** lanceolate, glabrous or sparsely scabrous at apex. **Lower glumes** (3.5-)4.5-6.7(-8) mm long, 1 vein; **upper glumes** (4.5-)6-10 mm long, 3 veins; **lemma callus** indurate, wider than long, scabrous laterally; **lemmas** (5-)7.5-11(-11.5) mm long, lanceolate, scabrous, or puberulent (rarely pubescent), sometimes minutely bidentate, acute, usually with an awn (0.5-)1-3(-4) mm long; **paleas** slightly shorter than to slightly longer than lemma body, emarginate or bidentate, glabrous or pubescent on the margins, scabrous or pubescent between the veins apically or throughout, the veins scabrous to about the middle or sometimes right to the base; **rachillas** scabrous to pubescent (sometimes sparsely) at least on abaxial side (away from palea), usually glabrous on the adaxial side; **anthers** 3, (3-)4-7.5(-8.5) mm; **ovary apex** pubescent.

Distribution and habitat.—Dry open slopes and moist streambanks in chaparral, thickets, open forests and forest openings (coniferous, oak or mixed forests). Often on ultramafic substrates. Sea level to about 1500 m elevation. From

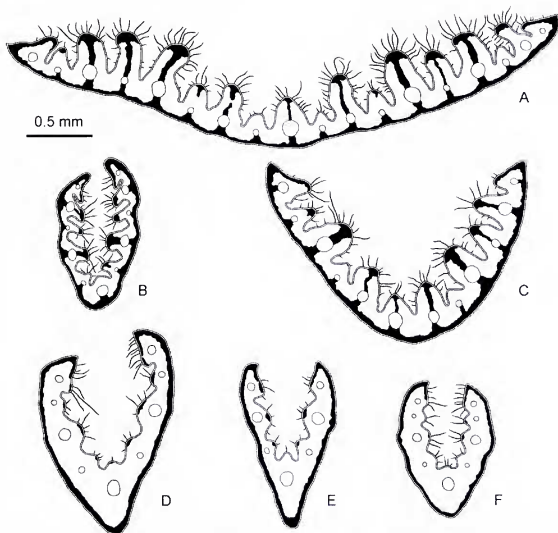


FIG. 1. Cross sections of leaf blades from vegetative shoots of *Festuca californica* (A, Howell & True 42564, RSA 300178; B, Crampton 4882, AHUC 25001; C, Hoover 8864, RSA 201564; D, Roos 92, RSA-POM 261420; E, Banks & Boyd 0509, DAO 796417; F, Banks & Boyd 0429, DAO 796414). A–B. Subsp. *californica*. C. Subsp. *hitchcockiana*. D–F. Subsp. *parishii*. Sclerenchyma tissue distribution indicated in black.

western Oregon to the Palomar Mountains in southern California (Fig. 2). It is reported as far north as Washington County, Oregon in the online specimen database of OSU (oregonstate.edu/dept/botany/herbarium/db.php).

KEY TO THE INFRASPECIFIC TAXA OF *FESTUCA CALIFORNICA*

1. Culms 30–80(–100) cm tall; internodes usually pubescent for 5–20 mm below the nodes; lower sheaths usually densely retrorse pubescent, sometimes sparsely pubescent or glabrous; blades 0.5–1.2(–1.5) mm wide, conduplicate (sometimes loosely), with (3–)5–9 shallow adaxial ribs (to about half as deep as blade thickness); sclerenchyma in small abaxial strands to a continuous band and adaxial strands present or absent, pillars rarely formed, girders absent; spikelets with 3–4 florets; plants of the San Gabriel and San Bernardino Mountains and southward

subsp. *parishii*

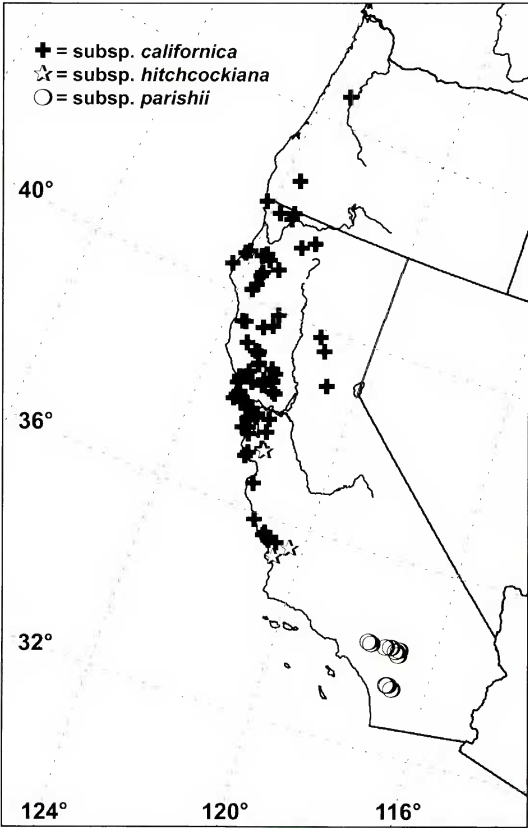


FIG. 2. Distribution of specimens of *Festuca californica* examined in this study. + = subsp. *californica*. ☆ = subsp. *hitchcockiana*. ○ = subsp. *parishii*.

1. Culms 60–180(–275) cm tall; internodes glabrous or pubescent for less than 5 mm below the nodes; lower sheaths usually glabrous or sometimes pubescent (the hairs spreading or sometimes retrorse); blades 0.8–2.5 mm wide (3–6.5 mm wide when flat), convolute, involute, conduplicate or often flat, with 7–15(–19) deep adaxial ribs (usually more than half as deep as blade thickness); sclerenchyma in a continuous abaxial band and with adaxial strands, forming pillars or girders at most of the veins; spikelets with (3–)4–6(–8) florets; plants more northerly in distribution.
2. Ligules a short ciliate membrane 0.2–1(–1.2) mm long; spikelets (8–)12–18(–20) mm long; lemmas (5–)7.5–11 mm long _____ subsp. **californica**
2. Ligules a longer membrane (usually 1–6 mm long), ciliate or not; spikelets 8–12(–17) mm long; lemmas 7–8(–8.5) mm long _____ subsp. **hitchcockiana**

Festuca californica* subsp. *californica

Culms 60–180(–275) cm tall; internodes glabrous or often pubescent up to about 5 mm below the nodes. **Sheaths** glabrous to pubescent; **collars** usually densely pubescent (at least at the margins), sometimes inconspicuously pubescent or glabrous; **ligules** 0.2–1(–1.2) mm long, a ciliate membrane; **blades** 0.8–2 mm wide (3–5 mm wide when flat), convolute, involute, conduplicate or flat, with 7–15(–19) deep ribs (usually more than half as deep as blade thickness); **sclerenchyma** a continuous abaxial band, with adaxial strands, usually forming girders at most veins (Fig. 1a, b). **Inflorescences** 15–25(–30) cm long. **Spikelets** (8–)12–18(–20) mm, with (3–)4–6(–8) florets. **Lemmas** (5–)7.5–11 mm long, usually entire, or sometimes minutely bidentate. Chromosome number: $2n = 56$ (Stebbins & Love 1941).

This is the most widespread subspecies, occurring from northwestern Oregon south to southwestern California. The leaf sheaths of the vegetative shoots are typically glabrous or scabrous, although plants with a few pubescent sheaths are not uncommon. The hairs are, however, usually not strongly retrorse and are often restricted toward the top of the sheaths. Plants with pubescent leaf sheaths differ from subsp. *parishii* in possessing sclerenchyma girders at the major veins in the leaf blades. Ligules are a ciliate membrane, usually about 0.5 mm long or less.

Selected specimens: **U.S.A. CALIFORNIA: Alameda Co.:** West Berkeley, 1916, *P.B. Kennedy*, (AHUC 5715); Berkeley, Shasta Road, N facing grassy slope, 1 Jun 1939, *G.L. Stebbins Jr.* 2743 (AHUC 6265); Niles Canyon, 3.5 mi W of Sunol, rubbly shale slopes, coastal sage assoc., 4 Jun 1958, *B. Crampton* 4882 (AHUC 25001). **Butte Co.:** NW side of Feather River Canyon near Pulga Bridge, serpentine canyon side, elev. 1400 ft, 11 Jun 1967, *J.T. Howell & G.H. True* 42564 (RSA 300178); about 2 mi SW of Forbestown Diversion Dam, NE of Forbestown, yellow pine forest, on damp red soil on steep roadcut near small stream, 10 Jun 1984, *L. Ahart & P. Ahart* 4701 (RSA-POM 365944). **Contra Costa Co.:** Mount Diablo, near junction of south and west roads, dry bank and roadside, 25 Apr 1931, *M.L. Bowerman* 757 (RSA-POM 300669). **Del Norte Co.:** along Smith River at 18-mile Creek, 3 mi E of Gasquet, in chapparral, alt. 500 ft, 24 May 1933, *J.P. Tracy* 12292 (RSA 10111); T17N R3E Sec. 32, at junction of roads to Bear Basin Butte and Big Flat, Douglas-fir woodland, elev. 3500 ft, 27 Jun 1976, *J.P. Smith* 8848 (RSA-POM 365942). **El Dorado Co.:** 1 mi E of Georgetown, mixed evergreen forest with shrub understorey, serpentine soil, 20 Aug 1959, *B. Crampton* 5445 (AHUC 26540). **Glenn Co.:** Mendocino Natl.

For. Camp Ellendale area, ca. 3.5 mi E Alder Springs Ranger Station, elev. ca. 3000 ft, 11 Jun 1963, *B. Crampton* 6831 (AHUC 29917). **Humboldt Co.**: Eureka, alt. 0–200 ft, 23 Jun 1900, *J.P. Tracy* 1175 (DAO 64999); Eureka, alt. 0–500 ft, 23 Jun 1901, *J.P. Tracy* 1175 (RSA-POM 206180); Willow Creek Canyon, alt. 2000 ft, 30 May 1926, *J.P. Tracy* 7518 (RSA 10106); T2S R5E Sec. 12, W of Alder Springs along 2507, growing on serpentine, Jeffrey Pine woodland, 16 Jun 1976, *T. Nelson & J. Nelson* 2740 (RSA 273307). **Lake Co.**: near Clear Lake, western shore of lake, in *Rhus-Pinus-Quercus* assoc., 27 Apr 1927, *A.A. Beetle* 1736 (AHUC 5948; DAV 4049); 1/4 mi S Whispering Pines, State Hwy 29, roadcut, yellow pine-Douglas fir-maple, some chaparral, 13 Jun 1955, *B. Crampton* 2832 (AHUC 21080). **Marin Co.**: near Olema, Aug 1898, *J.B. Davys* s.n. (RSA-POM 205834); Lagunitas, 7 May 1916, *L.S. Smith* s.n. (AHUC 2694); Mt. Tamalpais, Bootjack, on serpentine, 19 Jun 1938, *J.T. Howell* 13920 (RSA 221132); Point Reyes, scattered clumps in densely vegetated flats on N side behind dunes, 12 Jun 1945, *A.A. Beetle* 3998 (AHUC 10940); Angel Island, border between grassland and brush, 16 May 1946, *J.T. Howell* 21888 (DAO 65002). **Mendocino Co.**: Ukiah, 24 May 1899, *W.C. Blasdale & J.B. Davy* 5030 (RSA-POM 206181); Sherwood, open woods on dry slope, 15 Jun 1915, *A.S. Hitchcock* s.n., Amer. Gr. Nat. Herb. no. 487, (DAO 65000); T20N R10W Sec. 33, Mendocino Natl. For. along forest service road 1N02 just north of Monkey Rock mixed evergreen forest, elev. 5800 ft, 14 Jul 1977, *J.P. Smith, J.O. Sawyer & T.W. Nelson* 9412 (RSA 275370). **Monterey Co.**: coastal hills between Del Monte and Salinas, 2–3 mi on rd. to Johannesburg off rd. between Del Monte and Salinas, chaparral belt, 5 Jun 1946, *A.A. Beetle* 4283 (AHUC 12343); Sargent Cypress Forest, Alder Creek, serpentine, 2000 ft, 7 May 1960, *C.B. Hardham* 5666 (RSA 180213). **Napa Co.**: Monticello, Napa Road, 4 May 1927, *M. Wiesendanger* 700 (DAV 4059); 4 mi E of Rutherford, 25 Apr 1950, *J. Street* s.n. (AHUC 13901); Knoxville Quad., T11N R5W NW1/4 Sec. 25, Cedar Creek, 3.5 mi SW of Knoxville & ca. 1/2 mi W of Devilhead Road at junction of the creek and a dirt road, grassy meadow and streamside, alt. 1800 ft, 6 May 1986, *L. LaPre* s.n. (RSA 371706). **San Francisco Co.**: Daly City, Colma Canyon, Apr 1916, *P.B. Kennedy* s.n. (AHUC 2691); Mt. Davidson, summit, large clumps among brush, 22 Apr 1956, *P.H. Raven* 9004 (DAV 56413). **San Luis Obispo Co.**: Steiner Creek ("Serrano Canyon"), on brushy slopes in area of serpentine, 14 May 1947, *R.F. Hoover* 7168 (DAO 636020); Santa Lucia Mts., between Rocky Butte and Pine Mt., 21 Jun 1950, *R.F. Hoover* 7999 (DAO 635967). **San Mateo Co.**: Crystal Springs, 11 May 1902, *Le Roy Abrams* 2461 (RSA-POM 87695); on eastern flank of first ridge W of San Andreas Lake on road to Pilarcitos Lake, elev. 650 ft, 15 May 1956, *R. Bacibalupi et al.* 5645 (AHUC 32293). **Santa Cruz Co.**: 1 mi NW of Davenport, T10S R3W, 15 May 1935, *N.K. Carleson* 3 (AHUC 25862). **Siskiyou Co.**: near Happy Camp, *Pseudotsuga* woods on slope above the Klamath River, 31 May 1942, *A.A. Beetle & G.L. Stebbins Jr.* 3441 (AHUC 7646); T40N R9W Sec. 21, 2.0 mi S of Sugar Creek on Parrott Mill road, roadside in mixed conifer forest on metamorphic rock, +400 ft, 4 Jul 1972, *J.P. Smith, J.O. Sawyer & M. O'Meara* 5735 (RSA 273423). **Solano Co.**: Vaca Mts. facing Sacramento Valley, Gates Canyon, slopes wooded with live oak, bay and chaparral, 12 May 1958, *B. Crampton* 4784 (AHUC 24872). **Sonoma Co.**: Duncan Mills Quadrangle, T6N R11W, near Bodega Port, elev. 25, 21 Apr 1934, *H.S. Yates* s.n. (RSA 123473, 123478), and *H.S. Yates* 3806 (AHUC 25861); NE slopes of Fitch Mt. near Healdsburg, 10 Jun 1952, *P. Rubtzoff* 1236 (DAO 291944). **Tehama Co.**: Mendocino Natl. For., Paskenta Dist., Crane Mills logging road, Whiskey Saddle, under conifers, elev. 4720 ft, 16 Jun 1954, *B. Crampton* 1965 (AHUC 20661). **Trinity Co.**: New River trail from Grays Falls Campground on N side of Trinity River and W side of New River, rock outcroppings in California mixed evergreen with Douglas fir and digger line, elev. 1000 ft, 7 Apr 1973, *J.P. Smith* 5962 (RSA 244973); T31N R10W Sec. 13, County Line Road along Brown's Creek, Garry oak woodland, elev. 2200 ft, 7 May 1978, *J.P. Smith, J.O. Sawyer & T.W. Nelson* 9879 (RSA 296765); Bonanza King Quadrangle, T39N R7W Sec. 34, Shasta-Trinity Natl. For., Bear Creek at its junction with Trinity River, mixed conifer forest, elev. 3000 ft, 15 Jun 1979, *J.P. Smith & T.W. Nelson* 10103 (RSA 293182). **Oregon; Benton Co.**: T11S R5W Sec. 18 NW 1/4 of NW 1/4, MacDonald State Forest N of Corvallis, trail to Butterfly Meadows, edge of opening in Douglas-fir forest on slope, mostly sunny spot, 15 Jun 1994, *B.L. Wilson & E. Camacho* 704H (DAO 786419). **Josephine Co.**: Galice Creek road 3.0 mi from junction with Rogue River road at Galice, steep

serpentine hillside on N side of creek, common in partial shade at edge of oak-pine woods by the slope, elev. 1250 ft, 10 May 1974, K.L. Chambers 3915 (DAO 540761).

Festuca californica* subsp. *hitchcockiana (E.B. Alexeev) S.J. Darbyshire, comb. et stat. nov. BASIONYM: *Festuca hitchcockiana* E.B. Alexeev, Byull. Moskovsk. Obshch. Isp. Priir., Otd. Biol., n.s., 87(2):111. 1982. TYPE: U.S.A. CALIFORNIA. Santa Clara Co.: 6 May 1921. A.H. Wölley-Dod 207 (HOLOTYPE: K).

Culms 60–120 cm tall; internodes glabrous or pubescent for up to 5 mm below the nodes. **Sheaths** glabrous, scabrous or sometimes retrorse pubescent; **collars** densely to sparsely pubescent or sometimes glabrous; **ligules** (1–)1.5–6 mm long, with or without apical cilia; **blades** 0.8–2 mm wide (3–5 mm wide when flat), convolute, involute, conduplicate or flat, with 7–15(–17) deep adaxial ribs (usually more than half as deep as blade thickness); **sclerenchyma** as in subsp. *californica* (Fig. 1c). **Inflorescences** 15–25 cm long. **Spikelets** 8–12(–17) mm long, with (4–)5–6(–8) florets. **Lemmas** 7–8(–8.5) mm long, entire or minutely bidentate. Chromosome number unknown.

This subspecies is distinguished by its longer ligules which are usually not ciliate, but often lacerate. Ligules of leaves of the vegetative shoots are usually (1–)1.5–2 mm long while those of the culm leaves may be even longer. The collars may be glabrous or pubescent. Sclerenchyma in the leaf blades on the vegetative shoots is well developed with girders present at the major veins (Fig. 1c). The spikelets and lemmas tend to be somewhat smaller in this taxon than the other subspecies. Although the range overlaps with that of subsp. *californica*, it occurs only in central California (Santa Clara and San Luis Obispo counties) near the southern part of the range of the typical subspecies. It is less commonly collected than the other two subspecies and appears to have a more restricted distribution. The form of the ligule and somewhat smaller spikelets and floral bracts so clearly distinguish these populations that subspecific rank seems warranted.

Specimens seen. U.S.A. CALIFORNIA: **San Luis Obispo Co.**: See Canyon, 3 May 1948, R.F. Hoover 7512 (DAO 635974); See Canyon, 14 May 1964, R.F. Hoover 8864 (DAO 635612, 635951; RSA 201564); See Canyon, lower part of Perfumo Canyon, clay soil from serpentine, 14 May 1964, R.F. Hoover 8878 (DAO 635956).

Festuca californica* subsp. *parishii (Piper) S.J. Darbyshire, comb. nov. BASIONYM: *Festuca aristulata* subsp. *parishii* Piper, Contr. U.S. Natl. Herb. 10(1):33. 1906. *Festuca parishii* (Piper) Hitchc. in Jepson, Fl. Calif. 1:169. 1912. *Festuca californica* var. *parishii* (Piper) Hitchc. in Abrams, Ill. fl. Pacific States 1:222. 1923. TYPE: U.S.A. CALIFORNIA: San Bernardino Mountains, Mill Creek Falls, alt. 5500 ft, 20 Jun 1901. S.B. Parish 5036 (LECTOTYPE, designated by Hitchcock in Jepson 1912: 169; US-5562100).

Culms 30–80(–100) cm tall; internodes usually densely pubescent up to 20 mm below the nodes. **Sheaths** usually densely retrorse pubescent, rarely glabrous or sparsely pubescent; **collars** usually densely pubescent, at least at margins (rarely glabrous); **ligules** (0.2–)0.5–1.5(–2) mm, a ciliate membrane; **blades** 0.5–1.2(–1.5)

mm wide, conduplicate (or loosely folded), with (3-)5-9 shallow adaxial ribs (up to about half as deep as blade thickness); **sclerenchyma** in small abaxial strands to a continuous band, with or without adaxial strands at the major veins, rarely forming pillars (girders absent) (Fig. 1d-f). **Inflorescences** 10-20 cm long. **Spikelets** 11-16 mm long, with 3-4 florets. **Lemmas** (8)9-11.5 mm long, usually minutely bidentate, sometimes entire. Chromosome number unknown.

This subspecies occurs in dry chaparral or open forests of southern California in the San Gabriel, San Bernardino and Palomar Mountains (Fig. 2). Although the lemmas tend to be somewhat larger than the other two subspecies, overall plants tend to be smaller. Leaf blades tend to be narrower and shorter (10-30 cm long, versus usually more than 30 cm long) and the sclerenchyma is less developed with the abaxial band often discontinuous or reduced to small fascicles opposite the veins, pillars only sometimes present and girders absent (Fig. 1d-f). Leaf sheaths of the vegetative shoots are usually densely retrorse pubescent, but are sometimes sparsely pubescent to glabrous.

Selected specimens: **U.S.A. CALIFORNIA: Los Angeles Co.:** San Dimas Expt. For., San Gabriel Mts., Wolfskill firebreak near Brown's Flat, 28 May 1942, *KHB* (624) 631, (RSA-POM 308944). **San Bernardino Co.:** San Bernardino Mts., 7 Oaks, Jul 1901, *A. Davidson* 2245 (RSA 415966); San Antonio Mts., Cucamonga Cañon at Charcoal Camp, abundant under oaks on a north slope, upper Sonoran Zone, alt. 4700 ft, 7 Jun 1919, *IM Johnson* 2166 (RSA-POM 1271, 6414, 6415); San Bernardino Mts., near Glen Martin, near falls on road below, 1 Jun 1941, *J. Roos* 92 (RSA-POM 261420); San Bernardino Mts., Waterman Canyon, shady hillside, 21 Apr 1943, *J. Roos* 2633 (RSA-POM 302531); San Bernardino Mts., Fredalba, open places in forest with *Pinus ponderosa*, *Quercus kelloggii*, etc., alt. 5800 ft, 9 Jun 1951, *J. Roos & L. Roos* 5061 (RSA 78227). **San Diego Co.:** Palomar Range, Agua Tibia Wilderness Area, western crest of Agua Tibia Mt. at head of a steep draw in the Pechanga Creek watershed, just NW of the large *Quercus agrifolia* woodland about the junction of the Palomar Divide and Dripping Springs trails, T9S R1W SW 1/4 NW 1/4 Sec. 4, near 33°25'10"N 116°59'38"W, elev. ca. 4500 ft, extremely steep slopes with woodland of *Pseudotsuga macrocarpa* and *Quercus chrysolepis* and understorey of *Ribes amarum*, *Polystichum*, *Monardella macrantha* ssp. *hallii*, *Carex triquetra*, locally common on more mesic exposures with some afternoon sun, 25 Apr 1995, *S. Boyd* 8508 (DAO 796415; RSA); NW Palomar Mts., Cleveland Natl. For., Agua Tibia Wilderness Area, E face of Eagle Crag, S of upper Arroyo Seco, W of Cutca Valley, along Palomar-Magee Trail, T9S R1W NE 1/4 SW 1/4 Sec. 14, elev. 4600 ft, big cone spruce woodland of *Pseudotsuga macrocarpa*, *Quercus chrysolepis*, *Linanthus floribundus*, *Keckiella ternata*, *Phacelia imbricata*, etc., granitic substrate with decomposed granite soil, aspect NE, slope 70%, 10 May 1995, *D.L. Banks & S. Boyd* 0429 (DAO 796414; RSA). NW Palomar Mts., Cleveland Natl. For., Agua Tibia Wilderness Area, N peak of Agua Tibia Mt. on NE corner of peak, just S of the Riverside Co. boundary, in a very steep bowl-shaped depression on the N flank of Agua Tibia Mt., T9S R1W SE 1/4 NW 1/4 Sec. 4, 33°25'18"N 116°57'24"W, big cone spruce woodland of *Pseudotsuga macrocarpa*, *Quercus chrysolepis*, *Rubus leucoderms*, *Ribes amarum*, *Polystichum imbricans* ssp. *curtum*, etc., granitic substrate and sandy humus-rich soil, aspect NW, slope 170% [sic], 1 Jun 1995, *D.L. Banks & S. Boyd* 0509 (DAO 796417; RSA); NW Palomar Mts., Cleveland Natl. For., Agua Tibia Wilderness Area, NE face of Eagle Crag, SE of the Crosley Saddle, S of Cutca Trail along drainage that parallels trail, E of upper Arroyo Seco, T9S R1W SE 1/4 Sec. 14, elev. 4520 ft, big cone spruce woodland of *Pseudotsuga macrocarpa*, *Quercus chrysolepis*, *Q. berberidifolia*, *Arctostaphylos glandulosa*, *Carex triquetra*, etc., granitic substrate with decomposed granite humus-rich soil, aspect S, slope 50%, 15 Jun 1995, *D.L. Banks & S. Boyd* 0684 (DAO 796416; RSA).

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